Session 2

Learning Outcomes, Syllabus Creation and Documentation

FAIR Training Material by Design
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What you can expect from this session

- **Introductions from us and our instructor styles**
  - Who we are and what we do
  - Our instructor styles and what you can expect from us
- **This session's**
  - **Content** - we're focusing on chapters 2, 3, and 8 of the FAIR Training handbook
  - **Learning Outcomes**
  - **How to participate in the activities**
  - **Reflections**

Topics and Themes to be Discussed in this Session

It is important to have a FAIR mindset in the planning stage

- FAIR must not be ad hoc...
    - Think ahead to providing Learning Outcomes that can be FAIR
    - Think about metadata that can make your training more FAIR
    - Consider your training's infrastructure and hosting needs

Integrating FAIR principles into your planning help sets the stage for making all subsequent steps within the Training Life Cycle more FAIR as well

Learning Outcomes

By the end of this session, learners will be able to:
- Describe pedagogical frameworks and methods that support Learning Outcome development (including Bloom's Taxonomy and the Smartie Principles)
- Create Learning Outcomes relevant to their own training
- Understand how Nicholl's Five Steps and the Training LIfe Cycle relate to FAIR
- Describe how documentation pedagogically supports FAIR trainings
- Describe methods for and means of documenting trainings documenting in a FAIR way

How to Participate and Session Reflections

Contribute your thoughts!
- Ask questions as we go along if anything is unclear
- Be curious! Both on the material and on each others experiences
- Write down any "Aha's" (things you come to think of) throughout the course

Code of Conduct
- Be respectful, honest, inclusive, appreciative and open to learning from all present
- Do not attack, demean, disrupt others or encourage such behaviours

Reflections
- We will be building in reflections throughout as activities, but we will also be seeking feedback in survey form after the course so that we can continue to improve this training

How FAIR relates to the TH Mission and "Good Pedagogy"

Infrastructure and hosting are made more organized and findable by good metadata and tagging

Good Infrastructure and Hosting

Metadata and tagging can help inform the design of the infrastructure and make more clear the hosting needs

Good Pedagogy

Good Metadata and Tagging
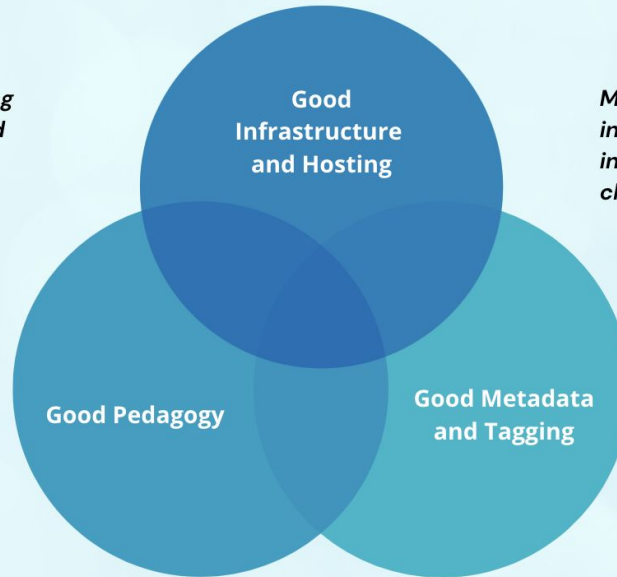
Learning outcomes can make more apparent what to assign as metadata and tags

Metadata and tagging can align with the learning outcomes of the training, making the training more findable, interoperable and reproducible

2.1 Learning Outcomes

Best Practices and their Relationship with FAIR

What are Learning Outcomes?

Statements expressing which **Knowledge, Skills, and Abilities (KSAs)** learners will be able to **demonstrate** upon completion of a learning experience or a sequence of learning experiences

What will learners be able to do, at the end of a lesson that, the teacher (you) can evaluate?

Recommended Reading: https://irds.stanford.edu/sites/g/files/sbiybj10071/f/clo.pdf

What are Learning Outcomes?

In short…
- Statements expressing the KSAs that can be **demonstrated** upon LE completion
- What learners will learn and the instructor can **assess**

https://irds.stanford.edu/assessment/assessment-overview/assessment-tools

What are Learning Outcomes and How do they relate to FAIR?

- **How we believe LOs most relate FAIR**
  - We feel that LOs most relate to Interoperability and Reuse
    - Interoperability: by having clearly stated LOs (blooms level, active verb, target audience), other users of the material can align the materials to new contexts
    - Reuse: easily identified purpose for use
  - FAIR - LOs help to give the training context, across each of the dimensions of FAIR
- **Activity - Short discussion:** How could LOs also relate to Findability and Accessibility?
  - 5min: Four groups, one for each letter of FAIR
  - Debrief afterwards

How do you write *good* Learning Outcomes?

By incorporating…

- SMARTIE Principles
- Bloom's Taxonomy

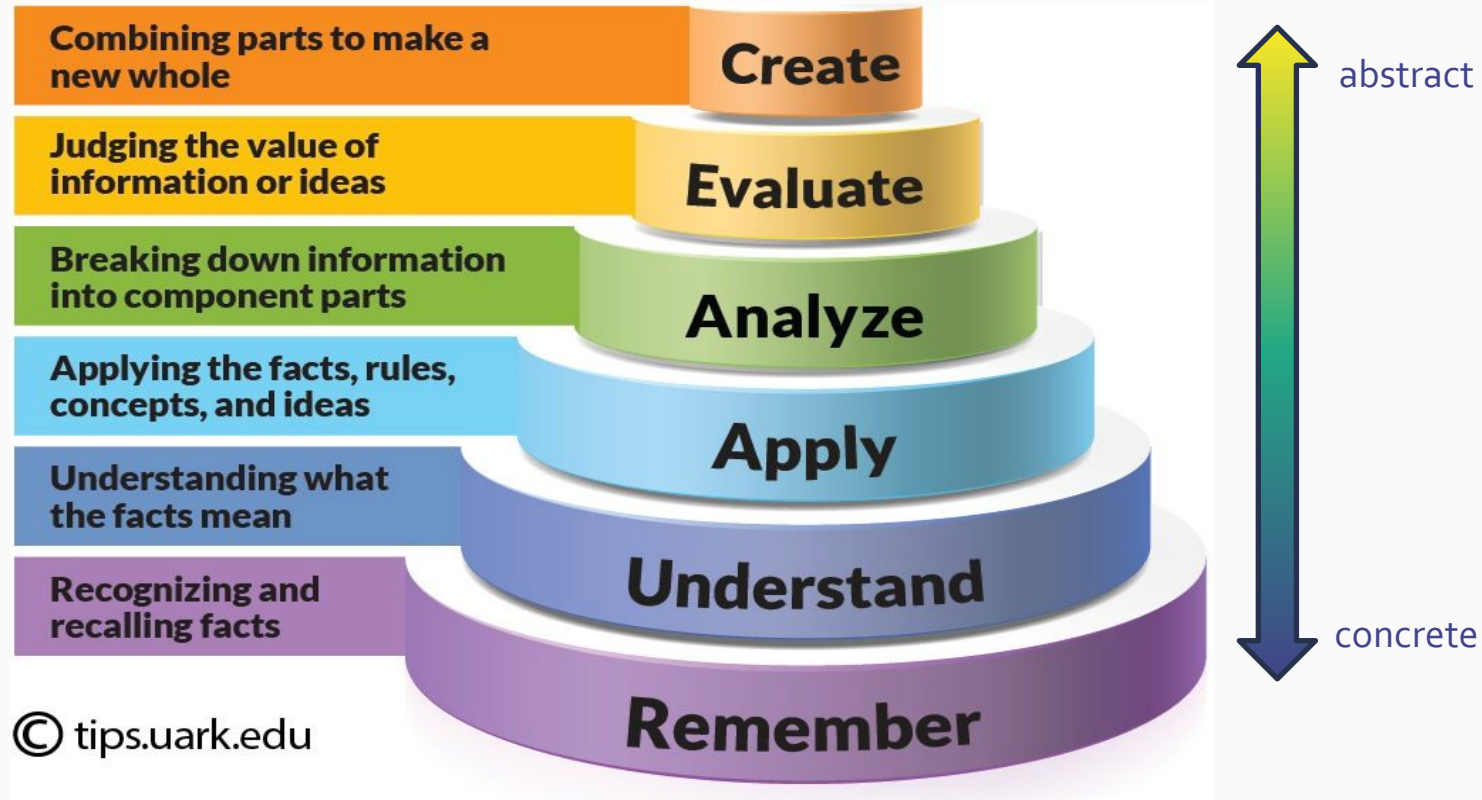# SMARTIE Learning Outcomes

S pecific

M easurable

A chievable

R elevant

T ime-limited

I nclusive

E quitable

Bloom's Taxonomy: a spectrum of cognitive complexity

Bloom's taxonomy of verbs

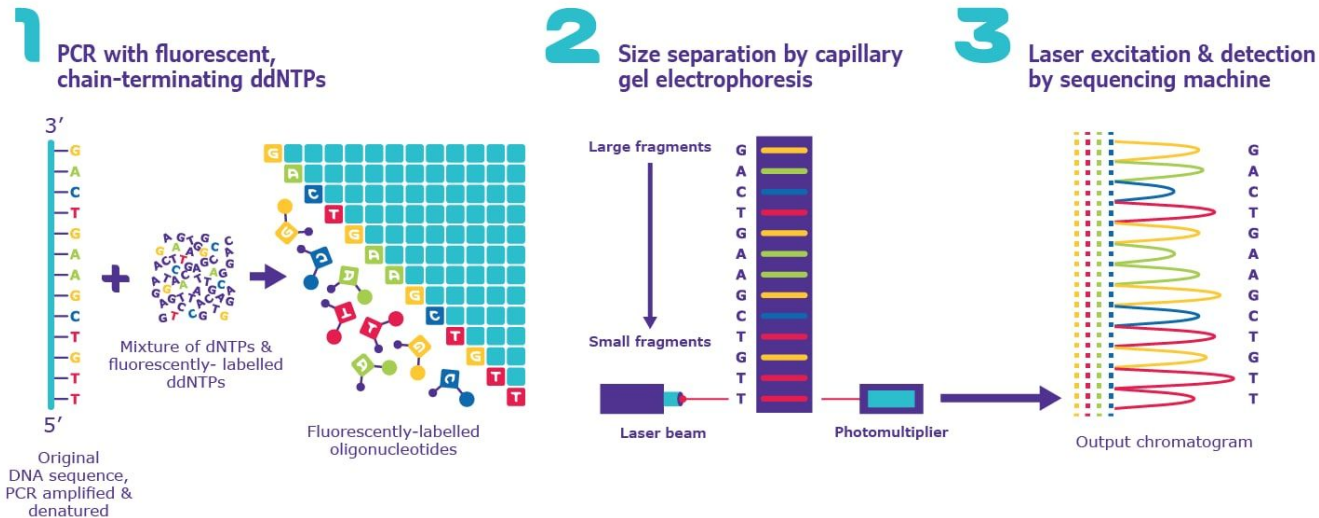|	
Create	assemble, build, collect, combine, compile, compose, constitute, construct, design, develop, devise, formulate, generate, hypothesize, integrate, invent, make, manage, modify, organize, perform, plan, prepare, produce, propose, rearrange, reconstruct, reorganize, revise, rewrite, synthesize, write
Evaluate	advise, appraise, argue, assess, compare, conclude, consider, contrast, convince, correct, criticize, critique, decide, defend, determine, discriminate, grade, judge, justify, measure, rank, rate, recommend, review, score, select, standardize, support, test, validate
Analyze	arrange, break down, categorize, classify, compare, conclude, connect, contrast, deconstruct, deduce, detect, diagnose, diagram, differentiate, discriminate, distinguish, divide, examine, explain, identify, integrate, inventory, list, order, organize, relate, separate, structure
Apply	calculate, carry out, change, choose, classify, complete, compute, construct, demonstrate, dramatize, employ, examine, execute, experiment, generalize, illustrate, implement, infer, interpret, manipulate, modify, operate, organize, outline, perform, predict, solve, transfer, translate, use, verify
Understand	arrange, associate, categorize, clarify, classify, compare, conclude, contrast, defend, diagram, differentiate, discuss, distinguish, estimate, exemplify, explain, express, extend, extrapolate, generalize, give examples of, illustrate, infer, interpret, match, outline, paraphrase, predict, rephrase, represent, restate, summarize, transform, translate
Remember	cite, define, describe, identify, inventory, label, list, match, name, outline, quote, recall, recognize, report, reproduce, restate, retrieve, show, state, tell

By the end of the course, learners will know DNA sequencing process

How to assess whether learners know the DNA sequencing process?

1 PCR with fluorescent, chain-terminating ddNTPs

3'
Original DNA sequence, PCR amplified & denatured

Mixture of dNTPs & fluorescently- labelled ddNTPs

Fluorescently-labelled oligonucleotides

2 Size separation by capillary gel electrophoresis

Large fragments

Small fragments

Laser beam

Photomultiplier

3 Laser excitation & detection by sequencing machine

Output chromatogram

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What do we mean by «knowing» the **DNA Sequencing** process?

- They are able to describe it?
- They are able to explain it?
- They are able to apply it theoretically/practically in a project?
- They are able to demonstrate it?
- They are able to use it in a solving problem?

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What do we mean by «knowing» the <u>DNA Sequencing</u> process?

- Are learners able to describe it?
- Or explain it?
- Or apply it?
- Or demonstrate it?
- Or use it in problem solving activities?

It would make more sense to ask:

What will learners be able to do to show they understand **DNA sequencing**?

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Writing LOs with assessable verbs

Avoid verbs that are:

unassessable

unmeasurable

open to interpretation

Writing learning outcomes using ACTION verbs

Think about: what learners will be able to do by the end of a course that I (the instructor) will be able to evaluate

By the end of the course, learners will be able to

....

Avoid verbs open to multiple interpretations

Use a verb that describes an observable action

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Activity: Create Learning Outcomes

1. **Reflect on your training**

2. **Define teaching/learning objectives** (describe your goals and intentions as the instructor)

3. **Write learning outcomes (**think about what learners will be able to do by the end of this instruction; using Bloom's taxonomy; actionable verbs)

4. **Identify the target audience and prerequisites**

2.2 Syllabus Creation

Best Practices and their Relationship with FAIR

How do you create a syllabus document?

Best Practices:

- Incorporate your Learning Outcomes
  - include a section dedicated to them
- Learning outcomes inform the decision making process of course and learning activity design
- Incorporate your metadata

What is metadata?

- Metadata will serve tags for your training to be found and organized amongst other trainings
- The metadata that will be helpful to add / track to make the syllabus more FAIR

How do you create a syllabus document?

Your syllabus, at minimum, should include:

- Basic information about the training (title, course code, meeting time and place, credits, etc.)
- Contact information for instructors
- Course description
- Eligibility for participation
- Key dates and times (course times; if applicable, assessment dates)
- Expectations for completion of the course
- Grading criteria (if applicable)
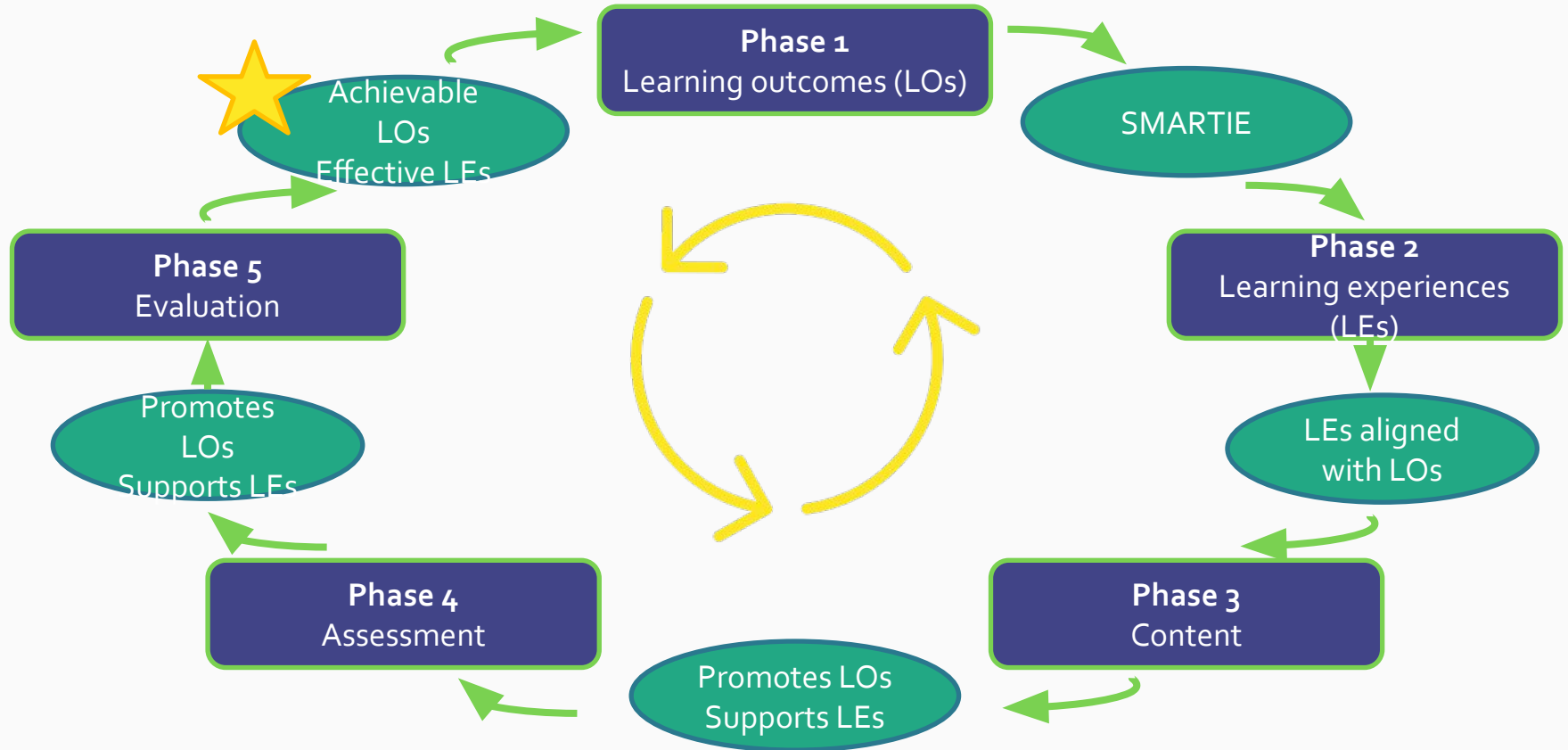
Your training will evolve as you develop it

And this is normal!

- Your thinking will change as your continue to refine the training
- Your training will likely continue to evolve even after you have delivered it
- This is a highly iterative process

It can be helpful to think of this iterative process in two ways:

- Nicholl's Five Steps
- The Training Life Cycle

Nicholl's Five Steps

Phase 1
Learning outcomes (LOs)

SMARTIE

Achievable LOs
Effective LEs

Phase 2
Learning experiences (LEs)

Phase 5
Evaluation

LEs aligned with LOs

Promotes LOs
Supports LEs

Phase 4
Assessment

Phase 3
Content

Promotes LOs
Supports LEs

Nicholls G. Developing teaching and learning in higher education. London:Routledge;2002.

The Training Life Cycle

Identify	Design	Develop	Deliver	Evaluate

Audience analysis: Who are the professionals that will receive the training? What is their role? How does learning impact their day-to-day?

Process analysis: What are your organization's workflows and processes? How does your chosen training method fall in line with these processes? Are there any bottlenecks or gaps the instructor can address through training?

Infrastructure analysis: Do you have a physical in-house space for conducting training? Is your digital infrastructure up to date for e-learning solutions?

You'll need to work out scope, depth, training objectives, and more. Once established, you can use this as the basis for curriculum topics and subtopics, serving as the foundation for your training solution. Designing your course will also involve creating any relevant training templates or documents you may need for the course.

Developing instructional materials and exercises: You'll need to develop the course materials and handouts based on the curriculum and templates designed in phase two. After finalization, it's time to test this material through the pilot.

Conducting the pilot: The pilot is a way to test training effectiveness in a real-world setting. You can test your course with a small group of learners with one or multiple sessions. The aim here is to collect feedback on the course.

Revising materials: After piloting, you'll need to revise materials, like presentations and job aids, based on the feedback you received. This can entail changing the course material. In some instances, it may also lead to changing the course curriculum to better suit learners during the implementation phase.

Scheduling the training: Before the training course starts, you'll need to work with your in-house training team or training provider to create a detailed schedule for attendance. Some important factors to consider include workload and participant availability.

Registering participants: A registration system helps trainers analyze the success of a training course, monitor attendance, and ensure smooth communication between members. This could be through a physical sign-up sheet or part of a digital learning management system.

Conducting the training: Trainers will begin teaching the course according to the chosen method and materials. While conducting the classes, training instructors should aim to create an environment that's conducive to learning. In smaller groups, they may also offer coaching or personalized attention.

Conducting surveys, interviews, and focus groups: You'll need to establish a system for gathering feedback. Surveys, interviews, and focus groups can all provide relevant insights into the training solution's impact.

Analyzing feedback and recommending changes: Once you've collected enough feedback, analyze it and identify any emerging trends. This will serve as the basis for further recommendations, updates, and improvements.

Updating material: Update material to reflect the feedback for future learning. This could include taking out irrelevant content or reformatting for better engagement.

Activity: How does the Training Life Cycle relate to FAIR?

Activity: Take two minutes to discuss with the person beside you

- *Debrief as a big group afterwards*

2.3 Documentation

Best Practices and the Relationship with FAIR

Why is documentation important to the FAIR process?

Activity: Take two minutes to discuss with the person beside you

Why is documentation important to the FAIR process?

Documentation is important because...

- Helps to add context
- Shows how the training has evolved and why
- Helps others recreate, repurpose or borrow from the training
- Helps to acknowledge author and instructor contributions
- Acts as a form of version history and version control
- Anything else?
  - * participants share their ideas with the bigger group*

How can we best document our trainings to make them FAIR?

Activity: Take five minutes to discuss in groups of 3-4

- *Debrief as a big group afterwards*

How can we best document our trainings to make them FAIR?

Data-level documentation includes information about specific data files like:
• Data type
• Structure of the data, e.g. questions, variables, concepts
• Data processing procedures, … and so on (this list is not exhaustive)

Project-level documentation describes:
• When, how and why the data were generated and by whom
• How the data were processed
• What quality assurance measures have been used, … and so on (this list is not exhaustive)

Anything else we can think of?

- * participants share their ideas with the bigger group*

How can we best document our trainings to make them FAIR?

Data-level documentation:

- Documents or ReadMe files contextualizing data and data types
- Data management plan
    - *What else?*

Project-level documentation:

- Recordings
- Syllabus
- Instructor's handbook
    - *What else?*

What are the differences between metadata and documentation?

Activity: Take two minutes to discuss with the person beside you

What are the differences between metadata and documentation?

There will likely be some overlap, so take some time at the start of the project to decide on what information can and should be repeated

- This can be very helpful for synchronizing your Learning Outcomes with your metadata
- Can think of metadata as tagging system for your training to be found amongst other trainings, whereas documentation refers to the textual context that describes the training

References

The FAIR Guiding Principles for scientific data management and stewardship
Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., ... & Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific data*, *3*(1), 1-9.

Go FAIR
https://www.go-fair.org/

How To FAIR
https://howtofair.dk/